PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: HENRI BENDEL

830,531

Date of Application and filing Complete Specification: July 8, 1957.

No. 21619/57.

Complete Specification Published: March 16, 1960.

Index at acceptance:—Classes 46, A1(A2B : A3 : B1X : B2), B5; and 111, A1.

International Classification:—B01d. C02b, c.

COMPLETE SPECIFICATION

Process and Device for Separating Sand from Water

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SPECIFICATION No. 830,531

Page 1, line 90, *after* "of" *delete* "the"
Page 1, line 92, *after* "treated" *insert* ","
Page 2, line 2, *after* "receptacle 1" *insert* ","
Page 3, line 6, *for* "pased" *read* "passed"

THE PATENT OFFICE
29th April, 1960

materials in the water being treated. This fine sand finishes by being deposited and by creating deleterious accumulations which sometimes necessitate the putting out of use an installation for their evacuation.

In practice, especially for sewage, the flow is never constant, as the volume of water discharged through the drains varies according to the hours of each day and according to the meterological conditions. Whilst it is easy to dimension a hydraulic sand removing device on the basis of a constant flow for obtaining the correct velocity, irrespective of the shape selected, it is difficult to produce a sand remover functioning in a satisfactory manner with a variable flow.

The present invention comprises a process for separating sand from water, characterised in that the water from which the sand is to be separated enters tangentially into a receptacle in which it is subjected to the action of a mechanical paddle which imparts thereto a constant horizontal movement, which is transverse relatively to that of the sedimentation of the sand.

[*Price*

ample, to be employed.

In the drawings:—

Fig. 1 is an axial section on the line I—I of Fig. 2.

Fig. 2 is a plan view.

Figs. 3 and 4 are sections on the lines III—III and IV—IV of Fig. 2 respectively.

In the drawing, the receptacle of the sand-separating device is indicated by 1. It is of circular cross-section and is provided, in its upper portion, with cylindrical walls to which are connected conical walls 2, which themselves are connected to a collector 3 for the decanted sand. A channel 4 passes tangentially at the side of the receptacle 1 and comprises a sluice 5 dividing it into two parts. One part A is connected to an inlet opening 6 in the receptacle, and a part B is connected to an outlet opening 7 of the receptacle, in front of which is located a partition 7*a* extending below the level 13 of the liquid. The part 7*b* of the opening 7 constitutes an overflow which determines the level of the liquid in the receptacle 1. The part A thus serves for the supply of water to be treated and the

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COMPLETE SPECIFICATION

Process and Device for Separating Sand from Water

We, PISTA S.A., a Company organised under the laws of Switzerland, of 12, Rue de Hollande, Geneva, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The effective operation of a sand separating device for sewage or velocity of water, depends on the flow-velocity of the water passing through.

In the case of the treatment of sewage, when the flow is too slow, the heavy organic matters are deposited with the sand and enter into fermentation. In this case, the recovered sand cannot be used or stored without having been previously washed.

When, on the contrary, the velocity is too high, a portion of the finer sand is not deposited and is entrained with the organic materials in the water being treated. This fine sand finishes by being deposited and by creating deleterious accumulations which sometimes necessitate the putting out of use an installation for their evacuation.

In practice, especially for sewage, the flow is never constant, as the volume of water discharged through the drains varies according to the hours of each day and according to the meterological conditions. Whilst it is easy to dimension a hydraulic sand removing device on the basis of a constant flow for obtaining the correct velocity, irrespective of the shape selected, it is difficult to produce a sand remover functioning in a satisfactory manner with a variable flow.

The present invention comprises a process for separating sand from water, characterised in that the water from which the sand is to be separated enters tangentially into a receptacle in which it is subjected to the action of a mechanical paddle which imparts thereto a constant horizontal movement, which is transverse relatively to that of the sedimentation of the sand.

This mechanical velocity control may also be combined with a rotating device for the aeration of the treated water.

The invention also includes a sand separating device for carrying out said process, characterised in that it comprises a receptacle connected to a supply channel and an evacuation channel for the water to be treated, said receptacle being of circular cross-section and with conical walls and in that it also comprises at least one rotary paddle member between the bottom of the conical receptacle and the upper level of its contents, so as to impart to the latter a constant horizontal movement which is transverse relatively to that of the sedimentation of the sand.

In the accompanying drawings is shown diagrammatically and by way of example one form of construction of a sand separator for separating sand from sewage, enabling the method, hereinafter described by way of example, to be employed.

In the drawings:—

Fig. 1 is an axial section on the line I—I of Fig. 2.

Fig. 2 is a plan view.

Figs. 3 and 4 are sections on the lines III—III and IV—IV of Fig. 2 respectively.

In the drawing, the receptacle of the sand-separating device is indicated by 1. It is of circular cross-section and is provided, in its upper portion, with cylindrical walls to which are connected conical walls 2, which themselves are connected to a collector 3 for the decanted sand. A channel 4 passes tangentially at the side of the receptacle 1 and comprises a sluice 5 dividing it into two parts. One part A is connected to an inlet opening 6 in the receptacle, and a part B is connected to an outlet opening 7 of the receptacle, in front of which is located a partition 7*a* extending below the level 13 of the liquid. The part 7*b* of the opening 7 constitutes an overflow which determines the level of the liquid in the receptacle 1. The part A thus serves for the supply of water to be treated and the

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part B for its evacuation after treatment.

Along the axis of the receptacle 1 is mounted, on supports 8, a device to assure a certain horizontal velocity and aerating the contents of the receptacle. Said device is formed by a hollow rotary shaft 9, driven by a motor 10. Said shaft carries at its lower end, located in proximity to the bottom of the conical receptacle, tubes 11 located radially and perforated with a large number of small holes through which the air under pressure, supplied through the shaft 9, can escape.

The shaft 9 also carries, between the arms 11 and the level of liquid in the receptacle 1, paddle members constituted by blades 12, adapted to impart to the contents of the receptacle a rotary movement in a plane which is transverse to that of the sedimentation of the sand. The blades 12 may be adjustable in position.

As will be seen in Fig. 1, the inlet opening 6 for the water to be treated is located below the level 13 of the liquid contained in the receptacle 1, which is obtained by locating a dipping partition 6a at the entrance of the supply channel into a receptacle 1.

In the upper part of the receptacle 1 is provided a device for collecting greasy and floating materials accumulating on the surface. Said device is constituted by a lateral chamber 14 communicating with the receptacle 1 by an opening 15 of which the upper part is located above the level 13, and the lower part underneath the latter. A blade 16, adjustable in position, is hinged to one of the sides of the opening 15 and extends above and below the level 13. The bottom of the chamber 14 is inclined towards the opening 15.

The collector 3 for the decanted sand is connected to the suction pipe 17 of a pump 18 for emptying the sand into a trough 19.

The operation of the said removing device is as follows:—

The crude water or sewage to be treated, arrives through the part A of the passage 4, and enters approximately tangentially into the receptace 1 through the opening 6. The liquid contained in the receptacle 1 turns in the direction of the arrows C by reason of the movement which it receives from the blades 12. The arrival of crude water does not interfere with this movement, but on the contrary tends to promote this by reason of the direction of the inlet passage.

The grease and floating materials penetrating into the receptacle 1 rise rapidly to the surface and are driven in the direction of its periphery by centrifugal force. The blade 16 constitutes a deflector which causes them to deviate and pass through the opening 15 into the chamber 14.

The speed of rotation of the shaft is adjusted in such a manner that the blades 12 impart to the mass of liquid contained in the receptacle 1 a constant horizontal transverse rotating movement, relatively to the movement of sedimentation of the sand, which is directed from the top downwards. The movements communicated to the liquid mass are selected in such a manner that the sand contained in the water can be deposited but the organic materials remain in suspension.

The compressed air escapes through the perforations provided in the upper surface of the arms 11, which turn with the paddle and produces continuous aeration.

The sand accumulates in the collector 3 and is evacuated through the pipe 17 and the pump 18 into the trough 19.

The degreased and aerated water, from which the sand has been separated and removed, is discharged through the opening 7 into the part B of the passage 4 so as to be conducted away for other operations for the purpose of subsequent treatment.

The advantage of the sand separating device described resides in the fact that its contents are kept in movement at a constant speed, independently of the delivery of the supply channel, even when the delivery is reduced to zero, as may occur in installations for the treatment of sewage at night. This is very important as in this manner it is avoided that the sand removing device functions as a decanting device for organic materials.

The aeration is particularly important in dry periods, that is to say, when the sewage is more concentrated and necessitates a large quantity of oxygen for its treatment. During rainy periods, the sewage is diluted in oxygenated rain water and necessitates less aeration.

In dry periods, the sewage remains longer in the tank than during rainy periods. The duration of aeration is inversely proportional to the flow of water. Assuming in dry weather that a delay of 5 minutes is necessary for the treatment of the water, the period of time is reduced proportionally in accordance with the higher supply in times of rain. In the time of rain there is generally a flow four or five times greater than during dry periods. When the supply delivery exceeds this proportion, the surplus is discharged through an overflow by-pass such as 5.

The force necessary for actuating the paddle and aeration apparatus is at a minimum in view of the low speed necessary.

The pump for the evacuation of the sand may be of the type operated by compressed air. It functions periodically according to the quantity of sand accumulated in the collector.

The aerator and the pump may, if necessary, be connected to the same source of compressed air.

It will be understood that when dealing with waste water not needing aeration or grease-removal, the sand removing device need not be provided with an aerator or a grease

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collecting chamber.

WHAT WE CLAIM IS:—

1. A process for separating sand from water, characterised in that the water from which the sand is to be separated and removed is pased through a receptacle in which it is subjected to the action of mechanical members which impart thereto a constant horizontal rotary movement, which is transverse relatively to that of the sedimentation of sand.

2. A sand separating device for carrying out the process claimed in claim 1, characterised in that it comprises a receptacle connected to an open inlet channel and an open outlet channel for the water to be treated, said receptacle being of circular cross-section and with conical walls and in that it also comprises at least one rotary paddle member between the bottom of the conical receptacle and the upper level of its contents, so as to impart to the latter a constant circular rotary movement in a horizontal plane which is transverse relatively to that of the sedimentation of sand.

3. A process according to claim 1, for the treatment of sewage, characterised in that the mechanical member is a paddle rotating in a horizontal plane with that of an aerating device.

4. A sand separating device according to claim 2, characterised in that it comprises an aerating device located in proximity to the bottom of the conical receptacle.

5. A sand separating device according to claim 2, characterised in that the rotary movement is effected by means of a rotary shaft located axially in the receptacle and carrying at least one paddle member.

6. A sand separating device according to claims 2, 4 and 5, characterised in that the rotary shaft is hollow and is connected to a source of air under pressure, at least one air diffusing member being located at the portion thereof nearest the bottom of the conical receptacle.

7. A sand separating device according to claim 2, characterised in that the portion of the receptacle with conical walls is connected to a collector for separated sand.

8. A sand separating device according to claim 2, characterised in that the entrance from the supply channel for water to be treated is directed approximately tangentially to the body of the receptacle.

9. A sand separating device according to claims 2 and 8, characterised in that the inlet opening of the water supply channel into the receptacle is located underneath the normal level of the liquid which it contains.

10. A sand separating device according to claim 2, wherein the outlet opening for liquid from the receptacle constitutes an overflow weir which determines the level of its contents.

11. A sand separating device according to claims 2 and 10, characterised in that the liquid outlet comprises a scum-board dipping below the level of liquid and which is situated before the overflow weir.

12. A sand separating device according to claim 2, characterised in that it comprises in its upper wall an outer chamber of which the communication opening comprises a deflecting member adapted to direct towards the interior of the chamber the floating greasy materials which move along the periphery of the receptacle, the bottom of the chamber being inclined towards its communication openings.

13. A sand separating device according to claims 2 and 5, wherein each paddle member is formed by a blade adjustable in position.

14. Process of separating sand from water according to either of the preceding claims 1 and 3, substantially as described.

15. Apparatus for separating sand from water, substantially as described with reference to the accompanying drawings.

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93—94, Chancery Lane,
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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1960.
Published by The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

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1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

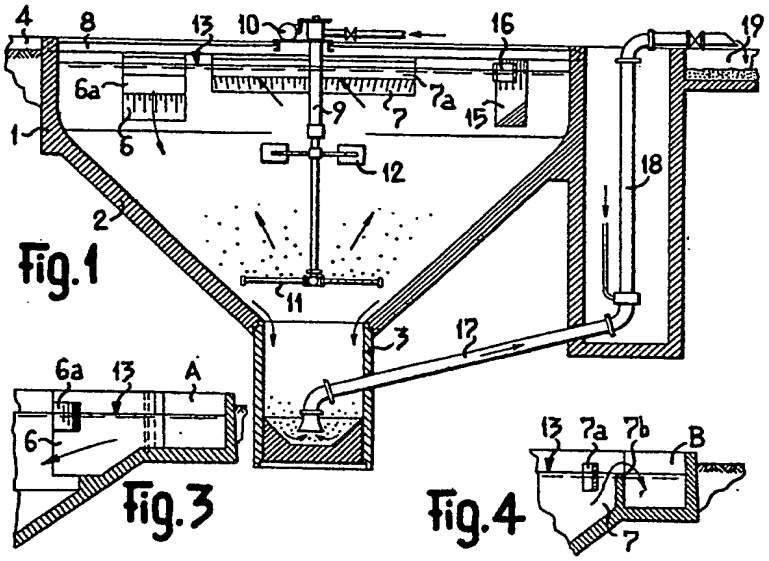

Fig.1

Fig.3

Fig.4

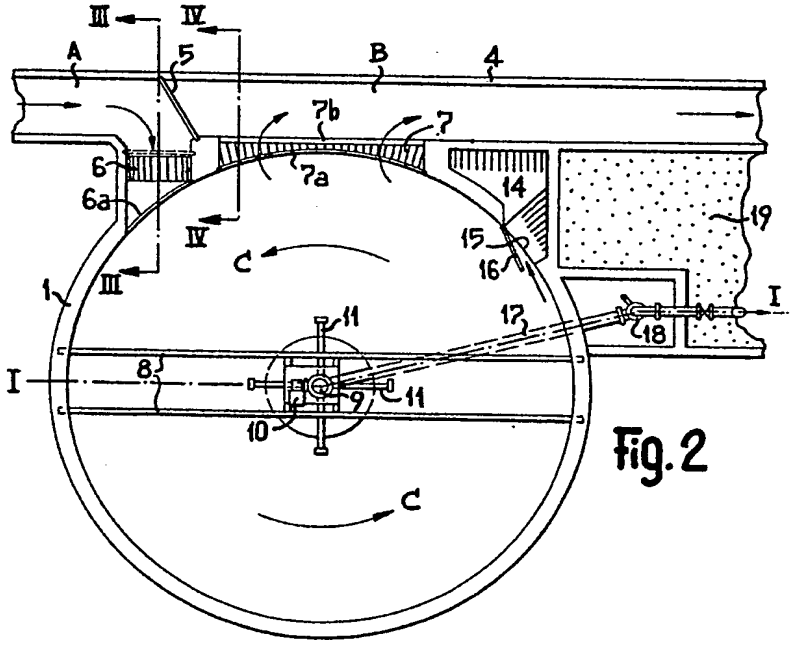

Fig.2